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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/677,085	09/29/2000	Hye-Jeong Kim	678-529 (P9530)	2155

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EXAMINER	
KADING, JOSHUA A	
ART UNIT	**PAPER NUMBER**
2661	

DATE MAILED: 10/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/677,085	KIM ET AL.	
	Examiner	Art Unit	
	Joshua Kading	2661	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 5-11, 13, and 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 2, 3, 5, 6, 8, and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by applicant's admitted prior art (AAPA).

In regard to claim 1, AAPA discloses "a timing error compensation system in an OFDM/CDMA (Orthogonal Frequency Division Multiplexing/Code Division Multiple Access) communication system, comprising:

a pilot symbol inserter for receiving a spread data symbol stream, and periodically inserting N pilot symbols each having a same phase using a specific period in a symbol unit to compensate a timing error of a receiver (figure 1, element 101; specification, page 2, lines 12-18)."

In regard to claim 2, AAPA discloses "a timing error compensation system in an OFDM/CDMA communication system said OFDM/CDMA communication system including an analog-to-digital converter which converts an OFDM signal to a digital OFDM symbol stream using sampling synchronization; a data symbol stream received from a transmitter, in which a pilot symbol is inserted at intervals of a predetermined number of data symbols; a guard interval remover for removing a guard interval inserted

in the OFDM symbol using frame synchronization; and a fast Fourier transform (FFT) device for performing fast Fourier transform on the guard interval-removed OFDM symbol and outputting a data symbol stream; said timing error compensation system comprising:

a pilot symbol detector which receives the data symbol stream and detecting the pilot symbols inserted in the data symbol stream at predetermined intervals in a symbol unit (figure 1, element 116; specification, page 3, lines 22-25); and

a timing compensator which determines a linear phase difference line for the detected pilot symbol using the pilot symbol and a reference symbol previously known by the receiver, generates a timing error estimation signal according to the determined linear phase difference line, and provides the timing error estimation signal to the analog-to-digital converter and the guard interval remover so as to determine the sampling synchronization and the frame synchronization (figure 1, element 117; specification, page 3, lines 25-27 and page 4, lines 1-14)."

In regard to claim 3, AAPA discloses "the timing error compensation system as claimed in claim 2, wherein the timing compensator comprises:

a phase detector to detect a phase of the pilot symbol in a sample data unit (figure 1, element 116; specification, page 4, lines 11-13);

a phase difference detector to detect a phase difference between the detected phase of the pilot sample and a reference phase and converting the detected phase

difference to a value within a specific range (page 4, lines 10-15 where the phase difference detector is part of element 117);

a phase fluctuation estimator to determine a phase difference line by accumulating the phase difference in a symbol unit, and counting [a] number of transitions in the phase difference line (page 4, lines 10-15 where the phase fluctuation estimator is part of element 117); and

a timing error compensation signal generator to generate a timing error estimation signal to compensate for a timing error according to the count value of the transition number (figure 1, element 117; specification, page 3, lines 25-27 and page 4, lines 1-14)."

In regard to claim 5, AAPA discloses "a timing error compensation system in an OFDM/CDMA communication system, which receives an OFDM signal, said OFDM/CDMA communication system comprised of a data symbol stream received from a transmitter, in which a pilot symbol is inserted at periods of a prescribed number of data symbols and outputting a data symbol stream through a fast Fourier transform, said timing error compensation system comprising:

a pilot symbol detector to detect a pilot symbol inserted in the data symbol stream at prescribed intervals (figure 1, element 116; specification, page 3, lines 22-25);

a timing compensator to determine a linear phase difference line for the detected pilot symbol, and generate a timing error estimation signal according to the determined

linear phase difference line (figure 1, element 117; specification, page 3, lines 25-27 and page 4, lines 1-14);

an analog-to-digital converter to determine sampling synchronization according to the timing error estimation signal from the timing compensator, and converting the OFDM signal to a digital OFDM symbol by the determined sampling synchronization (figure, element 111; specification, page 3, lines 9-12, 26-27 and page 4, line 1);

and a guard interval remover to determine frame synchronization according to the timing error signal from the timing compensator, and to remove a guard interval inserted in the OFDM symbol from the analog-to-digital converter (figure 1, element 112; specification, page 3, lines 12-14, 26-27 and page 4, lines 1-2)."

In regard to claim 6, AAPA discloses "the timing error compensation system as claimed in claim 2, wherein the timing compensator comprises:

a phase detector to detect a phase of the pilot symbol in a sample data unit (figure 1, element 116; specification, page 4, lines 11-13);

a phase difference detector to detect a phase difference between the detected phase of the pilot sample and a reference phase and converting the detected phase difference to a value within a specific range (page 4, lines 10-15 where the phase difference detector is part of element 117);

a phase fluctuation estimator to determine a phase difference line by accumulating the phase difference in a symbol unit, and counting [a] number of

transitions in the phase difference line (page 4, lines 10-15 where the phase fluctuation estimator is part of element 117); and

a timing error compensation signal generator to generate a timing error estimation signal to compensate for a timing error according to the count value of the transition number (figure 1, element 117; specification, page 3, lines 25-27 and page 4, lines 1-14)."

In regard to claim 8, AAPA discloses "a method for compensating a timing error in an OFDM system, which inserts a pilot symbol in a data symbol stream in a symbol unit at intervals of a predetermined number of data symbols, the method comprising the steps of:

detecting a pilot symbol inserted in a received data symbol stream at predetermined intervals (page 3, lines 22-25);

calculating a phase difference between the detected phase of the pilot symbol and a reference phase, and converting the calculated phase to a phase difference value within a specific range (page 4, lines 11-14); and

compensating a timing error using a transition number of the converted phase difference value (page 4, lines 11-14)."

In regard to claim 9, AAPA discloses "the method as claimed in claim 8, wherein the phase difference range is $\pm\pi$ (page 5, lines 21-22)."

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 7, 10, 11, and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art in view of van Driest (U.S. Patent 6,314,145 B1).

In regard to claim 7, AAPA discloses "the timing error compensation system as claimed in claim 6". However, AAPA lacks "a timing error estimation signal for compensating a timing error within a sample period is generated when the transition number count value is less than 1, and a timing error estimation signal for compensating a timing error over the sample period is generated when the transition number count value is greater than 1." van Driest however, discloses "a timing error estimation signal for compensating a timing error within a sample period is generated when the transition number count value is less than 1, and a timing error estimation signal for compensating a timing error over the sample period is generated when the transition number count value is greater than 1 (col. 7, lines 27-36 and 53-63 where the zero crossings are the transitions (as is the same in figure 3 of applicant's drawings); although van Driest doesn't specifically disclose the threshold value to be 1, he does disclose a threshold value and the choice of this threshold value is an arbitrary one dependent on design parameters and therefore a matter of design choice)." It would have been obvious to

one with ordinary skill in the art at the time of invention to include the threshold value with the system of claim 6 for the purpose of synchronizing the incoming data with the receiver clock. The motivation being proper and accurate signal reconstruction.

In regard to claim 10, AAPA discloses "a method for compensating a timing error in an OFDM system, which inserts a pilot symbol in a data symbol stream in a symbol unit at intervals of a predetermined number of data symbols, the method comprising the steps of: detecting a pilot symbol inserted in a received data symbol stream at predetermined intervals (page 3, lines 22-25); detecting a phase of the detected pilot symbol in a sample data unit (page 4, lines 11-14); calculating a phase difference between the detected phase of the pilot symbol and a reference phase, and converting the calculated phase to a phase difference value within a specific range (page 4, lines 11-14)..."

However, AAPA lacks "...counting the number of transitions within a specific range for the respective data samples; determining whether the count value is larger than a prescribed value; and compensating a timing error, when the count value is larger than the prescribed value." van Driest however, discloses "...counting the number of transitions within a specific range for the respective data samples (col. 7, lines 27-36 and 53-63 where the zero crossings are the transitions (as is the same in figure 3 of applicant's drawings));

determining whether the count value is larger than a prescribed value; and compensating a timing error, when the count value is larger than the prescribed value

(col. 7, lines 27-36 and 53-63 where the zero crossings are the transitions (as is the same in figure 3 of applicant's drawings); although van Driest doesn't specifically disclose the threshold value to be 1, he does disclose a threshold value and the choice of this threshold value is an arbitrary one dependent on design parameters and therefore a matter of design choice)."

It would have been obvious to one with ordinary skill in the art at the time of invention to include the count of transitions and the threshold with the rest of the method for the purpose of synchronizing the incoming data with the receiver clock. The motivation being proper and accurate signal reconstruction.

In regard to claim 11, AAPA and van Driest disclose the method of claim 10. However, van Driest lacks what AAPA further discloses, "compensating, when the count value is less than the prescribed value, the timing error by converting the count value to a phase difference line and estimating a slope of the phase difference line (Specification, page 5, lines 17-28)." It would have been obvious to one with ordinary skill in the art at the time of invention to include the compensating with the method of claim 10 for the same reasons and motivation as in claim 10.

In regard to claim 13, AAPA and van Driest disclose the method of claim 10. However, AAPA and van Driest lack "the prescribed value is '1'". Although AAPA and van Driest lack "the prescribed value is '1'", van Driest does disclose a threshold value (col. 7, lines 53-63) and the choice of the prescribed value is an arbitrary one dependent

on design parameters and therefore a matter of design choice. It would have been obvious to one with ordinary skill in the art at the time of invention to include the prescribed value being equal to '1' with the method of claim 10 for the same reasons and motivation as in claim 10.

In regard to claim 14, AAPA and van Driest disclose the method of claim 10. However, van Driest lacks "the phase difference range is ±π." However, AAPA further discloses, "the phase difference range is ±π (page 5, lines 21-22)."

Allowable Subject Matter

Claims 4 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

The objection to the drawings has been withdrawn in light of applicant's amended drawings submitted 28 June 2004.

The claim objections have been withdrawn in light of applicant's amendment filed 28 June 2004.

Applicant's arguments, see Remarks, page 7, paragraph 4, filed 28 June 2004, with respect to the rejection(s)of claim(s) 11 and 12 under 35 U.S.C. 112 first paragraph have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of applicant's acknowledgement that the limitations of claim 11 are found in applicant's admitted prior art. It should also be noted that because applicant's admitted prior art is not newly cited art and the fact that the limitation of claim 11 is specifically explained by applicant as being prior art (see Remarks, filed 28 June 2004, page 7, paragraph 4, lines 4-5), the new grounds of rejection for claim 11 does not bar the Finality of this rejection as stated in the Conclusion below. See MPEP § 706.07(a).

Applicant's arguments filed 28 June 2004 have been fully considered but they are not persuasive.

Applicant argues that claims 1, 2, 5, and 8 all have limitations not disclosed by applicant's admitted prior art (AAPA). Specifically, "inserting N pilot symbols each having a same phase using a specific period in a symbol unit to compensate a timing error of a receiver" for claim 1, "provides the timing error estimation signal to the analog-to-digital converter and the guard interval remover so as to determine the sampling synchronization and the frame synchronization" for claim 2, "to determine sampling synchronization" and "to determine frame synchronization" for claim 5, and

"compensating a timing error using a transition number of the converted phase difference value" for claim 8. The examiner respectfully disagrees.

Regarding claim 1, AAPA's specification, page 2, lines 12-14 specifically states that there is an inserter that inserts pilot symbols at regular intervals. It is further noted that each pilot symbol inherently has the same phase as indicated by the fact that the symbol is inserted regularly into the data. The fact that the act of inserting symbols is used "to compensate a timing error of a receiver" is the result of the inserting. Thus without saying that the inserter of AAPA obtains this result it is inherent.

Regarding claim 2, AAPA's specification, page 3, lines 9-14 and lines 25-page 4, lines 1-14 clearly state the function of the timing compensator and guard interval remover. Further, it is inherent that if the timing compensator and guard interval remover perform their respective tasks as indicated in AAPA, the synchronization of the sampling and frame will be determined because that is entire function of the timing compensator in the system.

Regarding claim 5, AAPA's specification, page 3, lines 9-14 and lines 25-page 4, lines 1-14, as with claim 2, clearly states the desired result of determining synchronization of the sampling and frame.

Regarding claim 8, AAPA's specification, page 4, lines 11-14 also clearly states that the timing compensator compensates for a timing error using the difference of the known reference phase and detected phase.

Applicant argues that for claim 10, AAPA does not disclose "compensating a timing error, when the count value is larger than the prescribed value." The examiner agrees and states this in the rejection. However, the examiner also used AAPA in view of van Dierst to reject claim 10, and used van Dierst to reject the deficiencies of AAPA. Further, AAPA covers all similar limitations as those found in claims 1, 2, 5, and 8 as explained above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua Kading whose telephone number is (571) 272-3070. The examiner can normally be reached on M-F: 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Joshua Kading
Examiner
Art Unit 2661

October 22, 2004

BOB PHUNKULH
PRIMARY EXAMINER